

forms, of which 22 species were figured. These investigations were published, in 1854, in the 'Mikrogeologie.' According to this, St. Paul's and Kerguelen's Land have 23 forms in common, namely, 14 Polygastria, 8 Phytolitharia, and 1 Anguillula. In Kerguelen's Land there was one new genus, *Disiphonia*, of which the same species has recently occurred again on Mont Blanc (1859, Monatsber. 779), and a second species in New Zealand (1861, Monatsber. 887). In St. Paul's 5 peculiar genera have been discovered; and it may be worthy of notice that the *Diffugia seminulum*, registered by me from Monte Rosa and the Himalayas, has been brought from St. Paul's in great abundance, together with 9 or 10 other species, some of which are new.

According to the existing indications of its substance as far as they could be tested, the Island of St. Paul does not belong to the lands which were above the water before the last great geological catastrophe; it appears to be a volcanic elevation of a more modern, although prehistoric period. *All the new genera of microscopic independent beings belong to mineral waters and salt water, and not to the land.* The *Lithosemata* are silicious particles of grasses, one of which has been formerly described and figured by me as *Lithostylidium comtum* of the trade-wind dust, and another as *Lithostylidium ornatum*. Traces of quite unknown and peculiar types of organic life, such as are exhibited by New Holland, New Zealand, and Madagascar, are wanting in St. Paul's, even amongst microscopic organisms.

From all the specimens examined, however, it appears that in St. Paul's an abundant, earth-forming, invisibly powerful organic life is going on. Whoever is inclined to regard the invisible as unimportant will leave it unnoticed. For my part, I cannot but regard this newly opened isolated focus of powerfully active minute life with deep interest, and wish much that many travellers may be incited to assist as much as lies in their power in the further elucidation of the great invisible rock- and earth-forming life of Nature. Perhaps the present communication may serve to bring to light certain points of view which may be capable of awakening interest in many ways.

XL.—On the *Archæopteryx lithographica*, from the *Lithographic Slate of Solenhofen*. By HERMANN VON MEYER*.

FEATHERS, or indeed any remains of birds, have hitherto been known in no rock older than the Tertiary period. Reports of greater antiquity have not been confirmed. Either the speci-

* Translated from *Palæontographia*, vol. x. p. 53, by W. S. Dallas, F.L.S.

mens upon which they are founded do not belong to birds, or the formation, if it contained actual remains of birds, has been represented as more ancient than it really was. This applies even to the Glarus slates, which were regarded as Cretaceous at the period when a bird occurred in them, whilst they are only Tertiary. In my investigations of this bird (Palæontogr. iv. p. 90), I have repeatedly indicated that the phenomenon known under the name of *Ornithichnites*, attributed to the footprints, traces, or tracks of birds, is but little fitted to decide so important a matter as the antiquity of existence of an entire class of animals. It has been made use of to claim a high antiquity for birds. But Ichnology, or the whole theory of fossil footprints, reposes only upon phenomena of resemblance; and although philosophers of the highest rank are to be found among its defenders, and its literature has acquired great dimensions, it is still destitute of a scientific foundation.

Remains of birds have frequently been supposed to occur in the Lithographic Slate; but it appeared, upon closer investigation, that these were derived from *Pterodactyles*, or from the *Rhamphorhynchi*, which belong to the same group, from the structure of which we cannot well conclude that the animals were clothed with feathers; and no traces of feathers were ever discovered with the numerous *Pterodactyles* found, of some of which the skeletons were perfect. (See my work 'Reptilien aus dem lithographischen Schiefer,' 1860, p. 21.)

From the circumstance that remains of birds were not to be found in pre-Tertiary formations, and that birds only begin to appear after the extinction of the *Pterodactyles*, which continued to occur up to the Chalk, it has been concluded that the *Pterodactyle* as it were represents the prototype of the bird.

This rendered it the more surprising that recently a feather should be brought to light, and indeed precisely in the same formation, and even at the same spot, which furnishes the greatest number of *Pterodactyles*. This discovery is an event of so much importance in palæontology that it calls for the most thorough investigation. Although I had not the least reason to doubt of the integrity of the source through which the fossil was intrusted to me, still I must admit that it was not without some mistrust that I set about the examination of the subject, which had to be carried out in all directions, and in which the chief object was to answer the following three questions:—

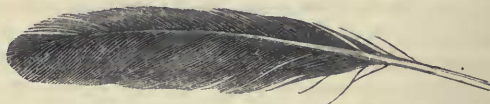
1. Is the rock the Lithographic Slate of the Upper Jurassic series?

2. Is the object upon it a feather such as birds possess?

3. Is the object really petrified, *i. e.* of the same age as the fossils of the Lithographic Slate?

As regards the first question, I can assert that the fossil before me, in its two corresponding slabs, is derived from the quarries of Solenhofen, whence it came to me direct. The stone agrees perfectly with the lithographic slate in fracture, weight, and mass. The colour is that of the ash-grey variety; the cleavage-surfaces are flat and spotted with brown, especially on the slab in which the feather is most distinctly shown. This slab is 0.022 metre, the opposite one 0.016 metre in thickness. The notion that the stone has been artificially prepared is quite inadmissible. On the outer surfaces small Echinoderms of the genus *Saccosoma* are observed, and these may serve to place the age of the stone beyond a doubt.

The second question may also be answered most satisfactorily. The object occurring on the stone agrees in all its parts so perfectly with the feather of a bird, that it is impossible to distinguish it therefrom. The feather is admirably preserved; the extremity of the stem alone is less distinctly exhibited, betraying



a softer consistence of this part, which will be due to the fact that the feather was not completely developed, or that it belonged to a young animal. The entire length of the feather is 0.069 metre, of which 0.054 belongs to the vane, which is truncated at right angles and rounded-off at the extremity, and has a nearly uniform breadth of 0.011 metre; the breadth only diminishes a little towards the truncated extremity. The stem was pretty strong, and measures fully 0.001 metre in thickness. The fibres of which the vane is composed may be distinctly traced; even the small barbules with which they are beset may be recognized. Here and there the vane gapes a little, probably in consequence of pressure upon the original curvature of the feather, which is completely flattened. It is at the same time nearly straight, and the vane on one side is twice as broad as that on the other, in which it resembles a wing or tail quill-feather. The vane is blackish brown, and becomes a little darker towards the extremity, which might be due to the original coloration. This feather is only a little smaller and less rounded or more angular at the extremity of the vane than that of the common Partridge.

Lastly, as regards the third question, I have employed the most careful investigation for its solution, but can only come to the conclusion that the feather is truly fossilized, and of the same age as the Lithographic Slate, to which, therefore, it truly

belongs, like the other fossils occurring therein. The employment of the two corresponding slabs was of great service in these investigations. No notion of the feather being produced by human hands is admissible. No draughtsman could produce anything so real. Nor is there any more room to think that a feather may have been pressed between two slabs of stone, and converted, by some process or other, into an artificial fossil. By careful examination it will be found that, notwithstanding its delicacy, the feather has produced slight impressions in the stone. The stone was therefore not fully hardened at the time of its being deposited. The substance into which the feather has been changed reminds one of the dendritic deposits; but dendritic formations have nothing to do with it. The mode of preservation resembles that of the birds' feathers which I have examined from Tertiary strata, and which I shall shortly publish.

As evidence of the genuineness of the feather, I may also state that upon the same cleavage-surface of the stone many small, fine, blackish fibres, like short hairs, are scattered about; these will likewise be derived from the epidermic covering of the animal. The fibres of the vane acquire a more hairlike aspect towards the quill, and in its immediate vicinity there are also numerous little isolated hairs, or shorter and not plumose filaments.

The genuineness of the feather found in the Lithographic Slate of Solenhofen is consequently not to be doubted.

As early as the year 1834 I indicated the danger to which we expose ourselves in palæontology by drawing logical conclusions in accordance with Cuvier's theory, from the similarity of particular parts as to the similarity of other parts or of the whole. I at the same time showed that, in one and the same creature, the most different types may occur together, purely developed. The fossil feather of Solenhofen, therefore, even if agreeing perfectly with those of our birds, need not necessarily be derived from a bird. And, indeed, a feathered animal, differing essentially from our birds, has occurred in the Lithographic Slate*. My first information about this was received by me, just after the completion of my investigations, from M. Witte of Hanover. This gentleman saw, in the possession of M. Häberlein of Pappenheim, upon a slab of Solenhofen slate, about $1\frac{1}{4}$ square foot in size, an animal of which he remarked that it possessed feathers, and that the feathers of the tail were attached, not, as in birds, to the last vertebra, but on each side of the caudal vertebrae. The feathers were, moreover, quite distinctly furnished with stem and vane. Soon afterwards, Professor Oppel of Munich wrote

* See 'Annals,' April 1862, p. 261.

me to the same effect, he having seen this fossil. The animal, of which the head is wanting, is abundantly endowed with feathers. It possesses a long tail, like *Rhamphorhynchus*, and a small pelvis; like birds, it has a single bone forming the tarsus; it is furnished with three toes; on the anterior limbs there is a fan of feathers, and also on the tail, on which the feathers radiate, not from the last vertebra, but laterally along the vertebræ. The simple tarsus of itself shows that this animal does not belong to the Pterodactyles, and the formation of the tail contradicts the idea that we connect with our birds, yet the feathers are not distinguishable from those of birds. The fossil feather from Solenhofen described by me will be derived from a similar animal, for which I have selected the name of *Archæopteryx lithographica**

XLI.—*Descriptions of newly discovered Spiders from the Island of Madeira.* By JOHN BLACKWALL, F.L.S.

A COLLECTION of Spiders recently made in the Island of Madeira, and presented to me by the Rev. Hamlet Clark, comprised the following species, which appear to be new or imperfectly known to arachnologists.

Tribe Octonoculina.

Family THOMISIDÆ.

Genus THOMISUS, Walck.

Thomisus spinifer.

Length of the male $\frac{1}{8}$ th of an inch; length of the cephalothorax $\frac{1}{16}$; breadth $\frac{1}{16}$; breadth of the abdomen $\frac{1}{20}$; length of an anterior leg $\frac{1}{4}$; length of a leg of the third pair $\frac{3}{20}$.

The cephalothorax is broad, convex, glossy, slightly compressed before, rounded in front and on the sides, abruptly depressed at the base, provided with a few strong black bristles, those on the frontal margin being directed forwards, and is of a reddish-yellow colour, an obscure band in the middle, which tapers from the eyes to its posterior extremity, being the palest. The eyes, which are seated on whitish spots, are disposed on the anterior part of the cephalothorax in two transverse curved rows, forming a crescent whose convexity is directed forwards; the eyes of each lateral pair are placed on tubercles, those of the anterior row being the largest of the eight. The falcæ are short, cuneiform, and vertical; the maxillæ are obliquely truncated at the extremity on the outer side, and inclined towards the lip, which is triangular; the sternum is heart-shaped; the legs are very un-

* Jahrb. für Mineral. 1861, p. 679.